

## THE ACADEMIC INCUBATION IMPACT: A SELECTION PROCESS EVALUATION

Giovane Gurgel,<sup>1\*</sup> Filipa Vieira<sup>2</sup>, Cristina Rodrigues<sup>2</sup> and Jorge Cunha<sup>2</sup>

<sup>1</sup> Federal Institute of Education, Science and Technology of Rio Grande do Norte, Brazil

<sup>2</sup> ALGORITMI Research Center, University of Minho, Portugal

\* Corresponding author: [giovane.gurgel@ifrn.edu.br](mailto:giovane.gurgel@ifrn.edu.br), Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Norte, Rua Raimundo Firmino de Oliveira, 400 - Conj. Ulrick Graff - Mossoró-RN, Brasil

### KEYWORDS

Business incubator, Impact evaluation, Selection process

### ABSTRACT

Among the main issues pointed out in the literature, much of the attention in the research has been related to impact evaluation of business incubation. Although the internal process is considered as a black box by several studies, the main components of incubation are already known. The focus of this work is an evaluation strategy of the first component - the selection process. The effectiveness of this stage was evaluated as the alignment between the incubator desired profile and the companies entrepreneurial orientation. Although innovativeness was perceived as the main characteristic, the survival-of-the-fittest strategy was more evident. The entrepreneurial orientation offers a set of relevant selection criteria because it expands the term weak-but-promise into better-defined concepts and relates to the existing incubation literature. Therefore, this analysis presents a more structured approach to effectiveness evaluation of selection process, opening the incubator black box. As future work, it is suggested to evaluate pre-incubation activities to verify their impact along with this approach.

### INTRODUCTION

Among the main issues pointed out in the literature, much of the attention in the research has been related to impact evaluation of business incubation. Academic business incubators are positioned at the intersection of innovation, entrepreneurship, university, regional development, and so on. The diversity of incubation environments brings with it major evaluation challenges. As stated by Hackett and Diltz (2004), the level of analysis is one of the main topics about the business incubators impact studies. It could affect directly on supported companies but, indirectly, influences the affiliated university, an economic activity sector, interest groups, the city and the country as a whole. The scope of current analysis is internal to the incubator. Although the internal process is considered as a black box by several studies (e.g. Weele, 2016, Hackett and Diltz, 2008), the

main components of incubation are already known. The focus of this work is an evaluation strategy of the first component - the selection process.

The paper is organized as follows: the next section highlights some evaluation approaches to business incubation. Then the effectiveness of the selection process is outlined. The following section presents the methods used to collect and analyze the data. The next section provides an in-depth critical discussion of the results and findings. Finally, the concluding remarks are presented.

### ACADEMIC INCUBATION IMPACT EVALUATION

Mian (1997) presented an evaluation framework of University Technology Business Incubators. The author indicates incubator regional impacts as the taxes, number of jobs and the clustering of suppliers. However, its framework emphasizes the short-term impacts associated with the university mission and the technological and business development. The evaluation approach has three dimensions: performance outcomes, effectiveness of management policies and practices, and services and their value added. The combination of different outcomes resulted in an evaluation strategy that involves both the contribution to the university and the actions for the development of companies. Other relevant contributions are: academic interaction and the political question related to stakeholders satisfaction. Nonetheless, the framework does not explore the black box of the internal incubator functions. Thus, suggesting the need for further studies.

The Rice (2002) approach applies co-production theory (Parks et al., 1981) to identify the contributing factors to incubation success. In this case, the relationship between the new ventures needs and what the incubator can assist is the central element of the evaluation. Co-production takes place in three modalities: passive environmental intervention, counseling, and networking. The author evaluated how incubators sponsored by universities and others with a goal of regional development affect the output elasticity both for the incubator management and incubated companies. It was perceived that the readiness

to engage directly affects the incubator manager effectivity. From the companies' point of view, the factors would be the time the manager has available for engagement as well as the variety of intervention forms that the incubator makes use of to assist companies. The results suggest that the sponsors and managers of the incubators should act so that more time is available for proactive actions in the incubation process. Therefore, managers of incubators with greater impact should operate in more co-production modalities and not only react to episodic requests.

Hackett and Dilts (2004) reviewed incubation impact studies from three different level of analysis (community, incubator, or incubatee). One of the measures of incubator success would be the alignment between the services offered and the demand required by the local market. Graduation is the simplest measure of startup success. Instead, it can be assessed by observing its development, e.g., regarding innovation and alliances obtained. Despite these advances, these approaches present significant challenges, mainly the politically charged environments in which incubators are involved. Even when a company is surviving but is not growing and is not profitable can also be a success. Hackett and Dilts (2004) consider that it is necessary to explain in more detail what happens in the incubation process rather than perceive the physical infrastructure or configuration of the incubator. The authors emphasize the need to use theories from different domains to achieve this goal. In this sense, theories about the new businesses creation, product development, and business assistance are relevant in the incubators context.

The evaluation issue of incubators was also analyzed by Bergek and Norrman (2008). The authors attempted to identify best practices according to a basic evaluation model made up of three main components: selection, business support, and mediation. Similar to Hackett and Dilts (2004) in the definition of success, performance was defined by Bergek and Norrman (2008) as the alignment between the obtained result and the objective of the incubator. The authors consider that this approach advances previous work focused on the use of variables that measure the final result and did not explore the black box of the incubation process. Therefore, it is possible to describe the model of different incubators and try to associate with appropriate indicators for each incubation context.

As stated by Mian (2011), besides incubators, can also be considered incubation process components: technology parks, research and innovation centers, technology transfer programs, entrepreneurial training and funding mechanisms. Given the complexity of performing such actions, these projects require time to test, experiment, adapt, fail, or succeed. It has been realized that successful technology incubation programs operate in a relatively developed socio-economic and infrastructural environments. According to Mian (2011), despite all the importance obtained by incubators, it is still difficult to exploit and with contradictory or conflicting claims. The

knowledge obtained is fragmented in several areas and lacks a unified theoretical basis.

Based on the above, the search for evaluation strategies capable of opening the incubation process black box has become increasingly relevant. Following this idea, the next section presents an evaluation approach to effectiveness in line with Mian (1997) internal process approach. Therefore, the vision presented here is the effectiveness of the first component – selection – as demonstrated by Bergek and Norrman (2008), using theories from different domains (Hackett and Dilts, 2004).

## **THE SELECTION PROCESS EFFECTIVENESS**

Initially, it was investigated whether the incubator had formal practices and how this happened (Mian, 1997). Usually, the candidate submits a business plan and eventually makes a presentation to the evaluators. Incubators may prefer companies at different levels of development. Choosing companies with a well-defined market means taking less risk. However, startups with high growth potential can also be attractive (Hannon and Chaplin, 2003). Findings of the study proposed by Aerts et al. (2007) have shown that incubators using different selection criteria got higher companies survival rates. According to Hackett and Dilts (2008), the selection performance means choosing the ideal type of company according to the real options theory. There is an emphasis on the product and investment potential of the company. Selecting weak-but-promising companies (Hackett and Dilts, 2004) is a challenging and essential task for the incubator. According to Bergek and Norrman (2008), the choices can be based on the idea, the entrepreneur or team. The idea concerns the market potential, the product. Entrepreneur-based choice means identifying personality, experience, and entrepreneurial potential. These two dimensions are combined with two possible approaches: picking-the-winners and survival-of-the-fittest. In the first strategy, the incubator analyzes those companies with higher potential of success previously - usually associated with universities. In the second strategy, the selection is less rigid, and the market is who will demonstrate if the entrepreneur will succeed.

The entrepreneurial potential is considered by many studies in incubators. As stated by Hughes et al. (2007), it has been demonstrated that entrepreneurial orientation explains the high performance of companies. The authors concluded incubator should have more actions related to strengthening the entrepreneurial orientation of the companies. In line with this, Gerlach and Brem (2015) mentioned the pre-incubation to select the candidates and to increase candidate's entrepreneurial orientation. According to Albort-Morant and Oghazi (2016), the entrepreneur's experience and family background of entrepreneurship make the entrepreneurs more positive about receiving advice and support. In the same line of reasoning, Löfsten (2016) indicated that previous

business experience is crucial to the success of incubated companies.

The effectiveness of the selection process will be based on two steps. First, identifying the entrepreneur-focused strategy (incubator level). Second, looking for the expected result (firm level). The impact here will be considered as the companies entrepreneurial orientation (Hughes et al., 2007). The alignment between the incubator action and the outcome presents a more detailed analysis of the effectiveness (Hackett and Dilts, 2004) in the incubator selection process.

## RESEARCH METHODOLOGY

According to Creswell (2013), qualitative research originates in anthropology, sociology and evaluation studies. The strategy adopted in this investigation will be the single-case study (Yin, 2014). An important feature is the in-depth analysis, i.e., understanding the dynamics of the case in its specific context (Saunders et al., 2016). The incubator selected is one of the oldest in Portugal (more than 20 years), currently supports more than 200 companies and is strongly linked to a university. The unit of analysis was the incubator and two start-ups (STP1 and STP2), which are the incubatees (Yin, 2014). Primary data were collected through semi-structured interviews with the incubator's operational manager and the startups' founders.

The data analysis applied the template analysis (Saunders et al., 2016) and the explanation building (Yin, 2014). In the template analysis, a list of codes and themes was compiled before coding. This initial template serves as a guide for coding content, but may be revised until the end of data analysis (Saunders et al., 2016). The list below presents the initial template. All the data was analyzed using the qualitative data analysis software NVIVO 12.

1. Incubator
  - 1.1. Selection
    - 1.1.1. Entrepreneur
    - 1.1.2. Strategy
      - 1.1.2.1. Survival-of-the-fittest
      - 1.1.2.2. Picking-the-winners
2. Startup
  - 2.1. Entrepreneurial orientation
    - 2.1.1. Proactiveness
    - 2.1.2. Risk-taking
    - 2.1.3. Innovativeness

## RESULTS

The submission of proposals can be made at any time and starts when the candidate fulfills a form in the incubator's website. It is necessary to justify the technology base, and the candidate can attach the files he deems essential. The selection is performed internally, the incubator team checks for the possibility of interaction with other incubator companies or existing laboratories. An overall evaluation of the proposal is made. Some companies may begin in virtual incubation (three months) to further

mature the business idea. Physical incubation lasts four years, but there are exceptions, e.g., biotechnology companies may need more time to market.

Based on the interview with the incubator manager, it was possible to understand which selection strategy proposed by Bergek and Norrman (2008) is more used by the incubator. The Figure 1 shows the coverage of each strategy.

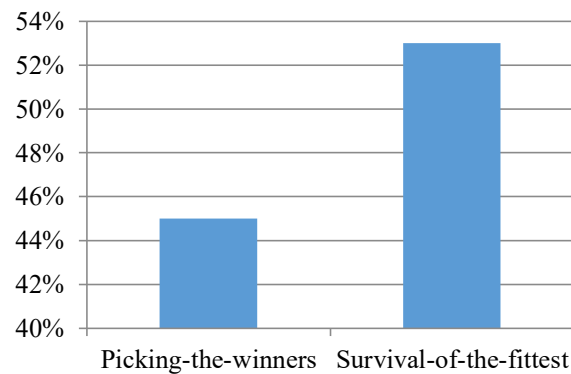


Figure 1: Selection Strategies Coverage

Survival-of-the-fittest is the strategy with the highest coverage, as mentioned by the manager: “It is his idea, and many of them start to see the work and often turn out demotivated, and therefore we call it the natural selection of projects.” The virtual incubation has this purpose; the candidates produce a business plan with the incubator guidance. As perceived by Gerlach and Brem (2015), this is an example of how pre-incubation contribute to increasing the companies entrepreneurial behavior. However, if the idea does not get traction, it will undo immediately. According to the incubator manager, sometimes it is preferable that the candidates come before the company creation because this initial contact avoids the occurrence of some common mistakes. The focus of the companies is diverse, according to the incubator manager: “There is not a specific focus. Even because technology is transversal, information technology is the most part, but then each of them works with blockchain, engineering, etc.”

The incubator also applies the picking-the-winners strategy. According to Bergek and Norrman (2008), this strategy is close to the university to achieve high innovation companies. The incubator participates in several events at the affiliated university to present the work developed by the incubator, as well as promote the creation of new companies based on research developed by students and teachers. According to the incubator manager: “[...] departments come here to visit and want us to go there and talk about what we do. I am going to talk [...] in the physics department and, therefore, are always asking to give a vision to the students.” However, the academic context follows a logic of operation that can sometimes hamper the creation of startups. According to the incubator manager: “[...] sensitizing teachers 20 years ago to this reality was very difficult and therefore we had

to open and start working with projects that did not come from the academia but fulfilled requirements to enter the incubator [...].”

This diversity of strategies (Aerts et al., 2007) is positive, but the companies do not necessarily have to come from the university. This aspect does not diminish the importance of the academy because the technology base, advanced services, and innovative orientation remain desirable - the incubator always verifies the connection to the scientific environment.

Several characteristics of the entrepreneurial profile desired by the incubator were detected. For example, perseverance, customers orientation, in addition to the technological and innovative basis. Figure 2 illustrates the most frequent words under the code “Entrepreneur”.



Figure 2: Frequent Words under “Entrepreneur” Code.

The larger the font size, the higher is the frequency of that term codified under “Entrepreneur.” The words most evident in the incubator manager's interview about the entrepreneurial profile desired in candidates were “innovator” and “technologic.” It was also perceived the importance of attitudes such as competition and risk. This approach was perceived as relevant by the founder of STP1: “It is important when the incubator selects companies, and this creates a spirit of innovation, competitiveness and becomes better and better.” Thus, the strategy used to select weak-but-promising firms (Hackett and Dilts, 2004) is flexible, but requires strong evidence for innovation and technological development. Before evaluating the entrepreneurial profile of the companies, it is important to understand their origin and motivations to choose the incubator. The STP1 founder already worked in France when decided to create his own business in Portugal and hence the choice of the incubator. According to the STP1 founder: “[...] I decided to settle here because there was an interesting reputation of the incubator and then proximity to universities because it is important in recruiting human resources.” The STP2 founders, while on the university, participated in several business idea competitions and the prize of the last one was a cash value and the first year of incubation free of charge. Accordingly, the opportunity was the main reason the STP2 chose the incubator. As stated by the STP2 founder: “[...] we started to develop and think about during the master's or final coursework, the master's thesis with an idea or product development that would lead to constitute the company, and thus was”. The search for foreign markets and the desire to

commercialize research during the university are signs of the entrepreneurial behavior. It is also worth mentioning the importance of the incubator's reputation as it deals with sensitive information about the companies business. To analyze the selection process outcome, the dimensions of entrepreneurship orientation (Hughes et al., 2007) were detected in companies. The coverage percentage of each dimension (innovativeness, proactiveness, and risk-taking) in each company can be seen in Figure 3.

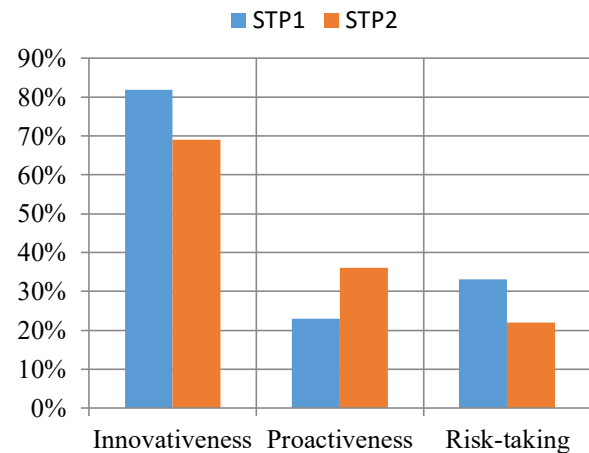


Figure 3: Companies Entrepreneurial Orientation Dimensions Coverage.

The STP1 has 11 months of incubation, a team of two people and business activity on programming and information technology consulting. The innovativeness was more codified (82%), followed by risk-taking (33%) and proactiveness (23%). Although the company is recently in the incubator, its innovativeness got the higher interview coverage. According to STP1 founder: “[...] we have to run because that is how we can innovate more. We have to invest so we can reap the rewards later. We have this vision very much”. Because of the frequent change in information technology market, is expected STP1 seeks innovation based differentiation to consolidate itself. The risk-taking is perceived by testing of new ideas, as stated by STP1 founder: “Good programming practices change very fast and we have to adapt. I have a profession that is younger than myself.” The STP2 has 66 months of incubation, a team of seven people and business activity on information technology consulting and machinery or equipment trading. The innovativeness was more codified (69%), followed by proactiveness (36%) and risk-taking (22%). The fund-raising of five million euros in research projects demonstrates the importance of innovation for STP2. According to the STP2 founder: “When we enter into a project of these we have access to knowledge that is therefore privileged. If we're closed, would not have gotten”. The search for opportunities and initiatives is motivated by the experience acquired over the years, as stated by STP2 founder: “Developing a new product took a long time, was very difficult, reached the market and

did not have acceptance. [...] However, we decided to try and find other opportunities, not to have just one product". The risk-taking is observable in the balanced actions in STP2: "There is a compromise here between the new opportunities and the focus. If we also see all the new opportunities, we will lose focus, and we can catch neither work them".

Both companies are close to entrepreneur profile desired by incubator. However, a cluster analysis demonstrated that STP2 has greater word similarity (Figure 4). As innovation and technology are very important in the selection process, the origin of STP2 in the university and a large number of research projects justify this proximity.

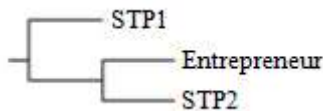


Figure 4: The Companies Similarity to Entrepreneur Profile Desired by Incubator.

Another cluster analysis (Table 1) identified which companies entrepreneurial orientation dimensions are closer to the entrepreneur profile desired by the incubator.

Table 1: Entrepreneurial Orientation Similarity to Entrepreneur Profile Desired by Incubator.

	Entrepreneur
Innovativeness	0.54*
Proactiveness	0.35*
Risk-taking	0.36*

\* Pearson correlation.

The analysis based on the two companies showed that the innovativeness is the closest dimension to the profile desired by the incubator. The lower similarity of the remaining dimensions does not reduce its importance because the highest coverage strategy was the survival-of-the-fittest. Therefore, the results suggest an innovative profile without a specific focus. This will generate a diverse environment within the incubator. However, as survival-of-the-fittest is predominant, it is indicated as a managerial recommendation the increase of proactiveness and risk-taking criteria in the selection process. These characteristics are likely to be further evaluated during the pre-incubation phase.

## CONCLUSIONS AND FURTHER RESEARCH

The first component of the incubation process is relevant not only for selecting weak-but-promising companies but also helps the candidates whose ideas are not yet well developed and try to move forward, that is, give a chance, an opportunity. The effectiveness of this stage was evaluated as the alignment between the incubator desired profile and the companies entrepreneurial orientation. Although innovativeness is the main characteristics desired by the incubator, the strategy of survival-of-the-

fittest was more evident. This suggests an important trade-off in this component.

The use of different theories to evaluate the companies selection proved useful because it opens more details of this process, demonstrating the connection between the incubator actions and the outcome. The entrepreneurial orientation offers a set of relevant selection criteria because it expands the term weak-but-promise into better-defined concepts and relates to the existing incubation literature.

Therefore, this analysis presents a more structured approach to effectiveness evaluation of selection process, opening the incubator black box. As future work, it is suggested to evaluate pre-incubation activities to verify their impact along with this approach.

## REFERENCES

- Aerts, K., Matthyssens, P., and Vandenbempt, K. (2007). "Critical role and screening practices of European business incubators." *Technovation*, 27(5), 254–267. <https://doi.org/10.1016/j.technovation.2006.12.002>
- Albort-Morant, G., and Oghazi, P. (2016). "How useful are incubators for new entrepreneurs?" *Journal of Business Research*, 69(6), 2125–2129. <https://doi.org/10.1016/j.jbusres.2015.12.019>
- Bergek, A., and Norrman, C. (2008). "Incubator best practice: A framework." *Technovation*, 28(1–2), 20–28. <https://doi.org/10.1016/j.technovation.2007.07.008>
- Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage publications.
- Gerlach, S., and Brem, A. (2015). "What determines a successful business incubator? Introduction to an incubator guide." *Int. J. Entrepreneurial Venturing*, 7(3), 286–307. <https://doi.org/10.1504/IJEV.2015.071486>
- Hackett, S. M., and Dilts, D. M. (2004). "A Systematic Review of Business Incubation Research." *The Journal of Technology Transfer*, 29(1), 55–82. <https://doi.org/10.1023/B:JOTT.0000011181.11952.0f>
- Hackett, S. M., and Dilts, D. M. (2008). "Inside the black box of business incubation: Study B—scale assessment, model refinement, and incubation outcomes." *The Journal of Technology Transfer*, 33(5), 439–471. <https://doi.org/10.1007/s10961-007-9056-9>
- Hannon, P. D., and Chaplin, P. (2003). "Are incubators good for business? Understanding incubation practice -- the challenges for policy." *Environment and Planning C: Government and Policy*, 21(6), 861–881. <https://doi.org/10.1068/c0215>
- Hughes, M., Hughes, P., and Morgan, R. E. (2007). "Exploitative Learning and Entrepreneurial Orientation Alignment in Emerging Young Firms: Implications for Market and Response Performance." *British Journal of Management*, 18(4), 359–375. <https://doi.org/10.1111/j.1467-8551.2007.00519.x>
- Löfsten, H. (2016). "Organisational capabilities and the long-term survival of new technology-based firms." *European Business Review*, 28(3), 312–332. <https://doi.org/10.1108/EBR-04-2015-0041>
- Mian, S. A. (1997). "Assessing and managing the university technology business incubator: an integrative framework." *Journal of Business Venturing*, 6568(96), 251–285. Retrieved from

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- <http://www.sciencedirect.com/science/article/pii/S0883902696000638>
- Mian, S. A. (2011). "University's involvement in technology business incubation: what theory and practice tell us?" *International Journal of Entrepreneurship and Innovation Management*, 13(2), 113. <https://doi.org/10.1504/IJEIM.2011.038854>
- Parks, R. B., Baker, P. C., Kiser, L., Oakerson, R., Ostrom, E., Ostrom, V., ... Wilson, R. (1981). "Consumers as coproducers of public services: some economic and institutional considerations." *Policy Studies Journal*, 9(7), 1001–1011. <https://doi.org/10.1111/j.1541-0072.1981.tb01208.x>
- Rice, M. P. (2002). "Co-production of business assistance in business incubators: an exploratory study." *Journal of Business Venturing*, 17(2), 163–187. [https://doi.org/10.1016/S0883-9026\(00\)00055-0](https://doi.org/10.1016/S0883-9026(00)00055-0)
- Saunders, M., Lewis, P., and Thornhill, A. (2016). *Research methods for business students* (7th ed.). Pearson.
- Weele, M. (2016). *Unpainting the black box: Exploring mechanisms and practices of start-up incubation*. Ph.D. Thesis. University of Utrecht. 265p.
- Yin, R. K. (2014). *Case study research: design and methods* (5th ed.).